Community BioRefineries
The Epitome of American Innovation

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Introduction to Bioplastics

"Bioplastics are bio-based polymers with two sustainability concepts: biodegradability and renewability."

We live in a world where mountains of plastic waste pollut**e** oceans and landscapes. It *__could__* naturally decompose, returning to the earth without causing harm. This vision drives the development of bioplastics - polymers derived from renewable biomass sources such as industrial hemp, corn, soy, sweet cane sorghum, and even dairy waste. Bioplastics offer a sustainable alternative to conventional petroleum-based plastics, with the potential to decrease petroleum consumption for plastic production by 15–20% by 2025. By harnessing the natural properties of plant-based materials and employing natural processes**,** like microbial fermentation in the Community BioRefinery's patented bioreactor, bioplastics are poised to revolutionize the plastics industry, by offering a crucial step towards reducing environmental impact and fostering a greener planet. Let's explore how these innovative materials are reshaping our approach to plastic production and waste management.

Community BioRefinery: Pioneering the Future of Bioplastics with PHA and PLA

Plastics are integral to modern life, offering convenience and versatility at a low cost. Even so, their environmental impact is a major concern, driving the search for biodegradable alternatives. The Community BioRefinery (CBR) will produce two promising bioplastics, Polyhydroxyalkanoates (PHA) and Polylactic Acids (PLA), that offer sustainable solutions. This webpage explores the production, properties, and environmental benefits of PHA and PLA, emphasizing their advantages over traditional petroleum-based plastics.

What are PHA and PLA?

Background. PLA and PHA are naturally-occurring biochemicals created as part of the fermentation process. Ethanol plants dump their waste water into local rivers, streams, etc. after recovering their ethanol. Problem is, the PLA/PHA present in the waste water have characteristics which make them deplete all the oxygen for the water – effectively killing all plant and aquatic life. The EPA frowns on this and ends up fining the ethanol producers, which for many are now just part of their overhead expenses.

The CBR Approach. When the water is separated from the desired biochemicals exiting the bioreactor, CBR *__recovers__* the PLA and PHA. The PHA is combined with leftover biomass fibers to create a bioplastic that is __biodegradable__ in both industrial composting and natural environment. Bioplastics made this way will not contribute to the "plastic islands" growing in the world's oceans; the natural microorganisms in the ocean will completely consume them. PLA, combined with the leftover fibers from feed stocks. This creates the type of bioplastic that is most commonly used to make surgical sutures, which don't have to be removed, but dissolve on their own. It will also decompose in industrial composting conditions.

Properties and Applications

Mechanical Properties

PLA: Exhibits stiffness and brittleness, making it ideal for a wide array of applications that demand rigidity, including food packaging, disposable tableware, beverage cups, 3D printing filaments, and medical implants.

PHA: Offers a superior flexibility and adaptability, allowing for tailored applications across a diverse range of industries, including medical devices, agricultural films, packaging materials, disposable utensils, and biodegradable containers.

Biodegradability

- **PLA:** Lower carbon footprint than petroleum-based plastics due to its renewable origins. The Community BioRefinery's ability to streamline the energy-intensive production process can result in zero greenhouse gas emissions.
- **PHA:** Biodegradable in both industrial and natural conditions, making it more versatile in waste management. This includes its ability to biodegrade in ocean waters, contributing to cleaner and healthier marine ecosystems.

Environmental Impact/ Carbon Footprint

- **PLA:** Lower carbon footprint than petroleum-based plastics due to its renewable origins. The advanced technological infrastructure implemented at the Community BioRefinery enables the comprehensive elimination of greenhouse gas emissions throughout its operational processes, positioning CBR as the foremost BioRefinery for the production of PLA.
- **PHA:** Offers the potential for a reduced carbon footprint as it can be manufactured using waste materials and less energy-intensive processes. Additionally, optimizing the BioRefinery's bioreactors maximizes yields from each feedstock source and enhances fermentation efficiency, making it an environmentally-friendly option for various applications including packaging, agriculture, biomedical engineering, textiles, and consumer goods.

Comparative Advantages of Biodegradability

PLA

- Cost-Effective: Currently cheaper to produce due to established methods.
- Widely Used: Extensively used in packaging, disposable items, and 3D printing.

PHA

- Degrade in a variety of environments, including both land and ocean settings, making it adaptable to different waste management systems.
- Flexible Properties: Can be customized for diverse applications.
- Sustainable Production: The CBR process holds the potential for a reduced carbon footprint through the use of waste-based feedstocks.

Community BioRefinery's Role

Community BioRefineries will play a crucial role in advancing PHA and PLA bioplastics. By integrating innovative fermentation processes and utilizing fermentation waste streams, Community BioRefineries enhance regional economic development and environmental stewardship. The production of PHA and PLA bioplastics in our BioRefineries offers:

* **Sustainable Waste Management:** Transforming waste into valuable bioplastics.

* **Economic Benefits:** Creating jobs and supporting local economies.

* **Environmental Impact:** Reducing plastic waste and greenhouse gas emissions.

Leftover Biomass Fibers from Industrial Hemp

Leftover biomass fibers from industrial hemp represent an additional resource in the production of bioplastics. These fibers can be processed and incorporated into various bioplastic formulations, enhancing their mechanical properties**,** and reducing the reliance on virgin materials. Community BioRefineries play a key role in the utilization of leftover biomass fibers from industrial hemp, further maximizing the sustainability and efficiency of bioplastic production processes. **It is in keeping with CBR's focus on using every molecule of biomass and feed stocks for a positive purpose.**

PHA and PLA represent the future of sustainable plastics, offering biodegradable alternatives to traditional petroleum-based plastics. While PLA is currently more cost-effective and widely used, PHA holds significant potential due to its versatile biodegradability and sustainable production methods. By leveraging the capabilities of Community BioRefineries, we can promote the use of PHA and PLA, contributing to a more sustainable and environmentally friendly future.

For more information on Community BioRefineries and their innovative processes, please visit our homepage at www.communitybiorefinery.com.